Abstract

Signal construction, detection and estimation techniques for use in uplink timing synchronization and access control in an orthogonal frequency division multiplexed (OFDM) wireless system or other type of wireless communication system. In accordance with an illustrative embodiment of the invention, timing and access signals to be transmitted in designated timing and access intervals are constructed from orthogonal multitone signals. The multitone signals may be similar to multitone signals used in OFDM data transmission, except that a cyclic prefix associated with reception of the signals in a base station is extended to cover the timing errors of mobile stations not yet synchronized. The invention also provides design techniques which optimize the time resolvability and peak-to-average ratio of the multitone signals, an efficient fast Fourier transform (FFT) based technique for maximum likelihood timing estimation, and a robust linear filtering technique for averaging timing estimates from different synchronizations.